Parasites
Fleas and Flea Allergy Dermatitis

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Main Parasites

- Arachnids
  - Ticks
  - *Trombicula*
  - *Cheyletiella*
  - *Sarcoptes*
  - *Notoedres*
  - *Otodectes*
- Insects
  - Lice
  - Fleas
  - Mosquitos
  - Flies

Ticks

Commonly found in fields, gardens

Ticks

- Skin irritation at attachment site
- If heavy infestation → anemia
- Vehicle for bacteria and viruses
- Allergic reactions

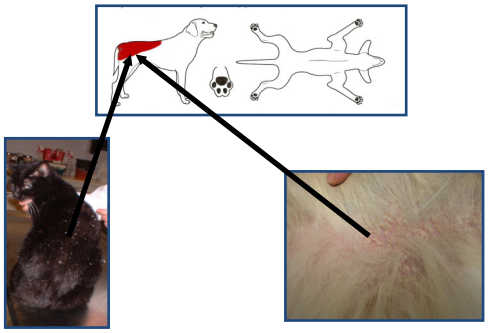
Cheyletiellosis

- Parasite of dogs, cats and rabbits
  - *C. yasguri* – dogs
  - *C. blakei* – cats
  - *C. parasitovorax* - rabbits
- Contagious and zoonotic – not host specific
- Most common in catteries and pet stores
- Variable but often intense pruritus over dorsal trunk

Cheyletiella sp

- Large surface dwelling mite (385 microns)
- Prominent accessory mouth part that terminates in diagnostic "hooks"
- Heavy scale over dorsal trunk - "walking dandruff"
- Diagnose by multiple superficial skin scrapings or acetate tape prep

Cheyletiellosis or "Walking Dandruff"

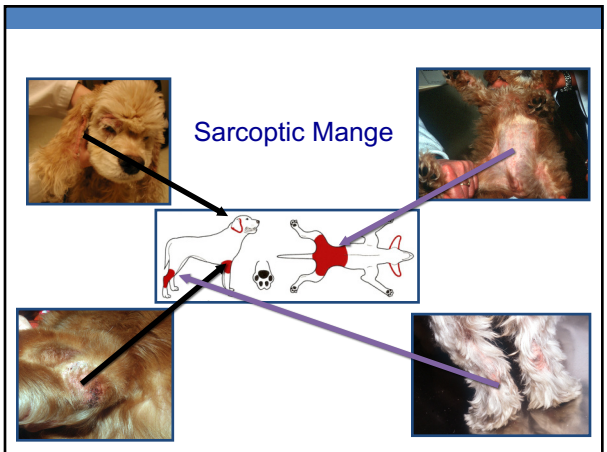


Cheyletiella sp

- Transiently affects humans but may be very pruritic
- Papules with central necrosis

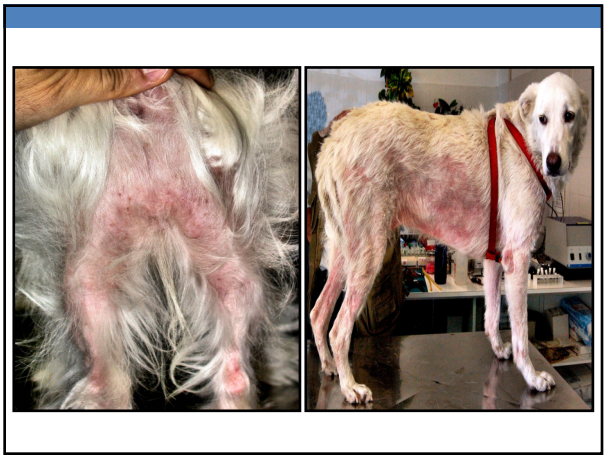
Sarcoptic Mange

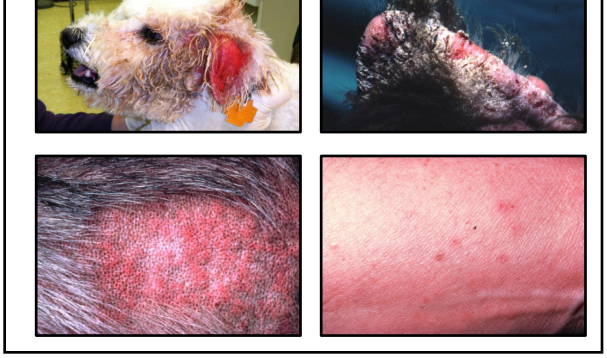
- *Sarcoptes scabiei var. canis*
- Highly contagious and zoonotic
- Entire life cycle on the host
- Females burrow in the stratum corneum and lay eggs
- Severe and rapid onset pruritus results from IgE-mediated reaction to proteins in fecal material
- Alopecia, crusts, scale, self-trauma on head, pinnae, feet, lateral limbs



Sarcoptic Mange - Diagnosis

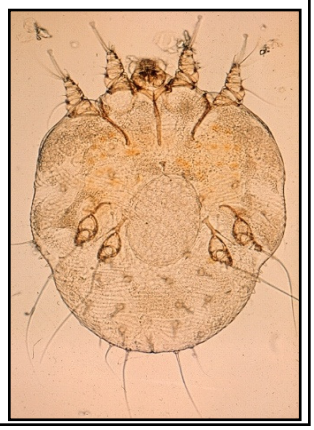
- History and clinical signs (lesion distribution)
- Pinnal pedal reflex
- Multiple broad superficial skin scrapings → looks for mites, eggs, fecal pellets
  - 50% false negative
- Positive ELISA test (2 to 4 weeks after infestation)
- Response to therapy



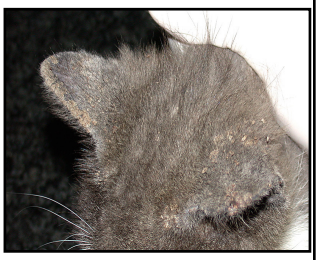


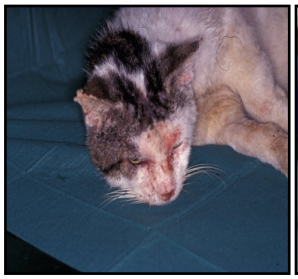
Notoedric Mange

- *Notoedres cati*
- Contagion from infected cats
- Entire life cycle on the host
- Females dig tunnels in the stratum corneum and lay eggs
- Alopecia, crusts, scale, severe pruritus, self-trauma on head/pinnae, feet, genital areas
- Diagnose by superficial skin scraping







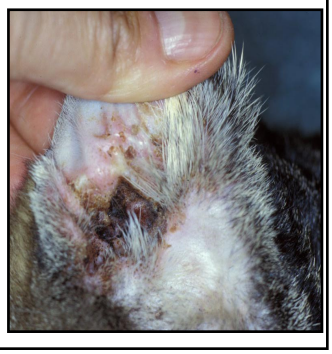

Otoacariasis

- Ear mite – *Otodectes cynotis*
- Lives entire life cycle within the ear canal

Otodectes cynotis

- Very contagious between cats, dogs, ferrets; especially young animals
- Bilateral (very pruritic) otitis with typical brown dry exudate
- If not treated → more severe forms of otitis
- Pruritic dermatitis involving facial areas (ectopic *Otodectes*)
- Diagnose by examination of ear debris in mineral oil +/- superficial skin scraping

Otodectes cynotis

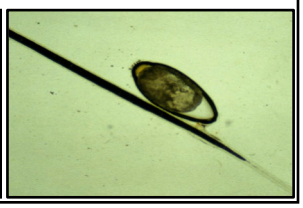



Lice

- Host specific with entire life cycle on animal
- Contagion by direct contact or fomites
- Usually young or ill animals
- Pruritus, papules, crusts, poor coat quality
- Asymptomatic carriers
- Diagnose by superficial skin scraping

Lice - Canine

- Chewing lice: *Trichodectes canis*
- Nits adhere strongly to the hair shaft
- May serve as intermediate host of *Dipylidium caninum*

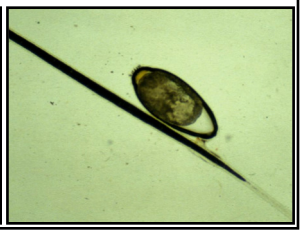



Lice - Canine

- Chewing lice: *Heterodoxus spiniger*
  - Warm climates only
- Sucking lice: *Linognathus setosus*
- Heavy infestation may cause anemia and weakness

Lice - Feline

- Chewing lice: *Felicola subrostratus*
- Affects only the cat
- Nits adhere strongly to the hair shaft

Cutaneous and Wound Myiasis

- Infection with dipterous larva
- Often treated with off-label ivermectin
- Mechanical removal and tissue debridement +/- sedation
- Manage secondary infection and provide analgesia

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Spinosad showed 79.7% efficacy on *Cochliomyia* hominivorax myiasis in dogs.

Spinosad showed an average 73.3% expulsion rate on *C. hominivorax* larvae.

A single spinosad dose is useful on clinical management of primary myiasis.

The comparative efficacy of afoxolaner, spinosad, milbemycin, spinosad plus milbemycin, and nitenpyram for the treatment of canine cutaneous myiasis

Hock Siew Han, Charles Chen, Carlo Schievano, Chiara Noli

First published: 06 May 2018 | https://doi.org/10.1111/vde.12548 | Cited by: 1

Results

Nitenpyram killed all larvae at 6 h post-consumption and spinosad/milbemycin at 7 h. In groups receiving afoxolaner or spinosad, all larvae were killed within 24 h. For those receiving milbemycin, two cases were still infested with live larvae at 24 h. Shih tzus and their crosses were most commonly affected.

Conclusion

Spinosad/milbemycin or nitenpyram seem to be effective drugs for the treatment of canine screw-worm myiasis. Afoxolaner and milbemycin are effective but exhibited slower larvicidal activity. Synergism between spinosad and milbemycin was observed.

Treatment and Prevention

- *Notoedres, Sarcoptes, Cheyletiella* and *Otodectes*:
  - Selamectin, oral or injectable ivermectin > fipronil
  - Otodectes: otic ivermectin (1:3) or amitraz (1 ml/30 ml) in mineral oil; commerically available 0.1% milbemycin product available

MilbeMite™
OTIC Solution (0.1% milbemycin oxime)

Treatment and Prevention

- *Trombicula* and lice:
  - Fipronil spray > selamectin, fipronil and imidocloprid spot-ons, oral or injectable ivermectin
    - Ivermectin: 0.3 mg/kg SQ every 2 weeks for 3 treatments
    - Apply spot-on products every 2 weeks for 3 treatments, then monthly for prevention
- Ticks
  - Fipronil spray or spot-on, moxidectin, selamectin, amitraz, flumethrin 2% (dogs only)

Newer Products

- Imidacloprid + flumethrin (Seresto® collar Bayer Animal Health)
- Slow release over 8 months

Isoxazolines

- Afoxolaner (Nexgard™, Merial)
- Fluralaner (Bravecto®, Merck)
- Lotilaner (Credelio™, Elanco)
- Sarolaner (Simparica™, Zoetis)

Treatment and Prevention

- Treat all in contact animals
- Address husbandry and condition of animal(s)
- Avoid introduction of new animals without treatment and quarantine
- Environmental treatment may be necessary for multiple animal households and heavy infestations
- Use products prophylactially and consistently

Fleas and Flea Allergy Dermatitis

Fleas: Why Fight Them?

- Diseases
  - Flea allergy dermatitis
  - Anemia and death
  - Tungiasis
- Vectors/hosts for
  - *Rickettsia*
  - *Bartonella*
  - *Dipylidium caninum*

Flea Allergy Dermatitis (FAD)

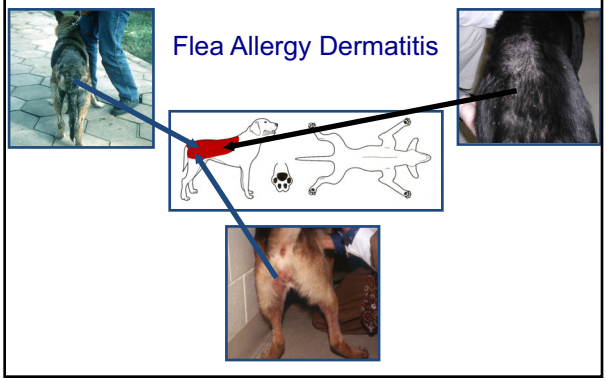
- Most common skin disease affecting dogs worldwide
- Typically will see evidence of fleas but not always
- May have fleas without FAD
- Few fleas can cause profound reaction

FAD – Pathogenesis

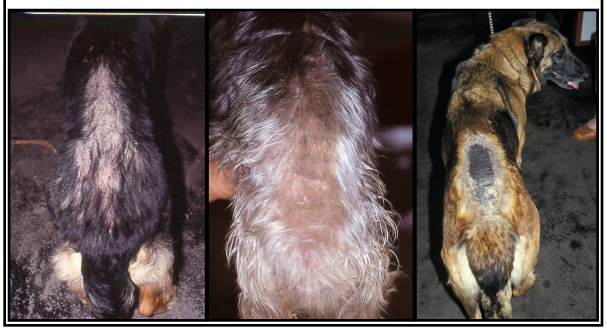
- Salivary antigen
- Only allergic animals show pruritus and dermatitis
- Dogs:
  - Continuously exposed → tolerance with low levels of IgG and IgE
  - Intermittently exposed → allergic within 12 weeks with flea-specific IgG and IgE
  - Exposed later in life → allergic
  - Dogs with AD at much higher risk

Signalment and History

- No breed or sex predisposition
- Usually between 3-5 years of age (rare at < 6 months)
- Worse in the warmer months, but may be present all rear round
- Often incorrectly applied or lack of flea control
- Intense pruritus often involving caudal half of body



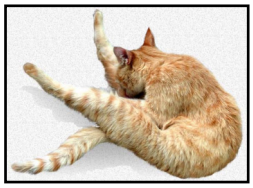
Alopecia, Erythema, Hyperpigmentation, Lichenification of the Lumbar Area



Erythema and Excoriations of the Perineum

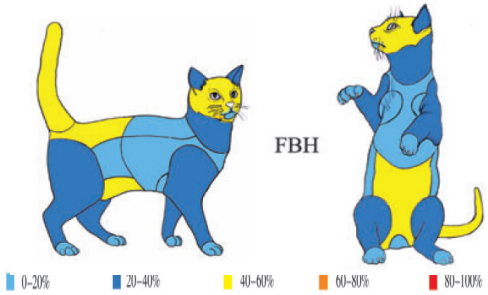
Pathogenesis - Feline

- Intermittently exposed cats → not predisposed
- Early exposure → blunts development of allergy
- Oral exposure (ingestion) → prevent the development of flea allergy?



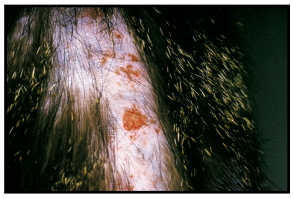
Clinical Manifestations in Cats

- Miliary dermatitis
- Pruritus directed at the tail base and neck
- Alopecia on the back, abdomen and groin
- Eosinophilic plaque/granuloma and indolent ulcer

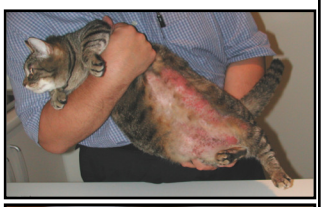


Hobi et al. Vet Derm 2011

Self-Induced Alopecia Due to Licking



Miliary Dermatitis



Eosinophilic Dermatoses

Differential Diagnosis

- Food allergy
- Cheyletiellosis
- Demodicosis
- Dermatophytosis
- Primary or secondary bacterial folliculitis localized on the trunk and posterior aspects

FAD - Diagnosis

- History and physical examination
- Presence of fleas or "flea dirt"
  - Often absent in cats
- Intradermal or serologic test (ELISA)
- Response to intensive flea control and prevention

Flea Allergy Dermatitis

- After flea control trial (4-6 weeks)
  - Good response (>80%) → consistent with FAD
  - Moderate response (30-80%) → continue trial
  - No further response → concurrent disease
- Poor response (<30%) →FAD unlikely

FAD - Management

- Flea control
- Control of pruritus
- Treatment of secondary infections
- Improvement usually seen within 7 to 14 days after elimination of the fleas

FAD - Management

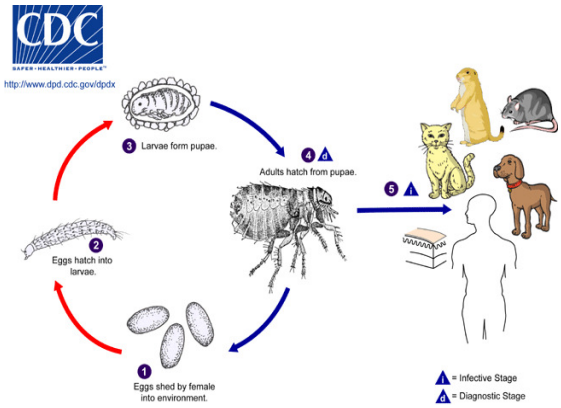
- *C. felis* parasitizes wildlife commonly
  - Wildlife may be important in contaminating the outside environment
  - Opossums, raccoons, feral cats
  - Rarely squirrels, rabbits, birds

Therapy

FAD - Therapy

- Glucocorticoids
  - Prednisolone 0.5-1 mg/kg/day
  - For short duration (10-14 days) and lower to every other day after 5-7 days
- Oclacitinib
  - 0.4-0.6 mg/kg PO q 12 hours x 14 days, then same dose q 24 hours
- Manage secondary skin infection with oral +/- topical therapy
- Antibiotic-steroid combination products on affected areas

Flea Control

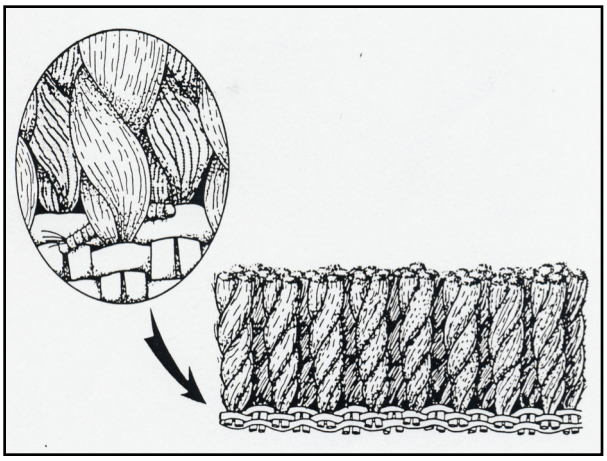


Flea Cycle - Eggs

- 0.5 mm long
- Deposited on the pet
- Fall to the ground
- Hatch after 1-10 days
- Best conditions: 25C and relative humidity > 50%

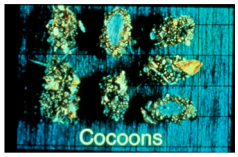
Flea Cycle - Larvae

- 2-5 mm long
- Consume flea feces
- Hide from light in depth of carpets
- 2 molts; pupate after 5-11 days
- Best: 20-30C and relative humidity > 50%



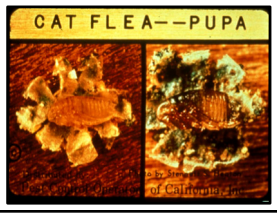
Flea Cycle – Cocoon/Pupa

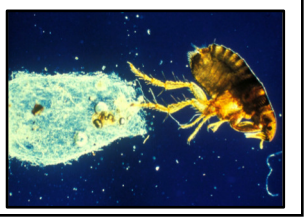
- 0.5 cm long
- Sticky and coated with debris
- Adult develops in 5-9 days
- Quiescent up to 50 weeks
- Excellent protection



Flea Cycle - Adults

- Emerge with pressure, CO2, heat
- Jump on host, feed within 10 minutes
- Die within 2 days without blood meal



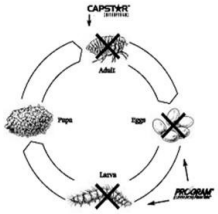


Flea Cycle - Reproduction

- Mating and egg production within 24-48 hours
- Up to 50 eggs in 1 day
- Up to 2000 eggs in 1 lifetime

Flea Control

- Ideal goals:
  - Quick killing of adult fleas on the animal
  - Prevention of egg hatching and larval development
  - Long residual effect
  - Repellency properties
  - Low toxicity



Knock Down Effect

- Flea bite elicits a reaction in allergic animals
- 100% of fleas are engorged with blood within the first two hours of feeding
- Ideal knock down activity: killing of fleas within two hours of contact

Flea Control

- Mode of action
  - Adulticides: rapid killing of adults
  - Insect growth regulators (IGR): prevention of reproduction
- Residual effect is important
- Use both adulticide AND IGR for best results
- Alternatively, use adulticide with ovicidal and larvicidal activity

Insect Growth Regulators (IGR)

- Interfere with development of pre-adult stages
  - Inhibit chitin synthesis (lufenuron)
  - Juvenile hormone analogues (methoprene and pyriproxyfen)
- Very low toxicity
- Always use in combination with adulticide

Effects On Immature Stages

- Residues of fipronil, imidacloprid, and selamectin on shedded hair and corneocytes may have effect in the environment
  - Effect of vacuum cleaning?
  - Long duration to work effectively
- Spinosad, nitenpyram and isoxazolines kill fleas before they lay eggs and prevents fleas from producing feces (larval food)

Adulticides

Traditional

- Pyrethrins and pyrethroids
- Organophosphates
- Carbamates

All act on the flea's nervous system

Modern Day

- Fipronil
- Imidacloprid
- Selamectin
- Indoxacarb
- Dinotefuran
- Spinetoram
- Nitenpyram
- Spinosad
- Isoxazolines

Adulticides

- Fipronil (Frontline®)
  - Spray or spot-on for dogs and cats
  - Diffusion within superficial lipid layer
  - Low toxicity, no absorption, long residual effect
  - Slow knock down effect
  - Effective for ticks
  - Frontline Plus® - adds IGR (methoprene)
  - Certifect® - adds methoprene + amitraz

Adulticides

- Imidacloprid (Advantage®)
  - Spot-on for dogs and cats
  - Low toxicity, no absorption, long residual effect
  - Slow knock down effect
  - Ineffective for ticks
  - Advantix II® – adds permethrin and pyriproxyfen
  - Advantage Multi®/Advocate® – adds moxidectin

Adulticides

- Selamectin (Revolution® or Stronghold®)
  - Spot-on for dogs and cats
  - Low toxicity
  - Long residual effect
  - Slow knock down effect
  - Effective for *Sarcoptes*, lice, ear mites > ticks
  - Effective for microfilariae and nematodes

Newer Products - Isoxazolines

- Newest trend in flea control
- Derived from sea sponge molecule
- Inhibit GABA gated Cl^- channels
- Highly effective against fleas/ticks with good residual activity
  - Most fleas killed within 4-8 hours with sustained effect > 30 days
- Recent studies suggest good efficacy against mites

Isoxazolines

- Afoxolaner (Nexgard™, Merial)
- Fluralaner (Bravecto®, Merck)
- Lotilaner (Credelio™, Elanco)
- Sarolaner (Simparica™, Zoetis)

Fluralaner Topical Solution

Adulticides - Administration

- Most must be given every 3-4 weeks
- Must be given all year round
  - Not only:
    - "When I see fleas"
    - "When he scratches"
    - "If it is warm outside"
- Must be given to all animals in home
- For topicals, apply when dry and wait two days after application for bathing

Therapy – Other Formulations

- Collars
  - Largely ineffective against fleas
  - Products available (US) which are very effective (Seresto®)
- Shampoos
  - Good knock down effect
  - No residual effect - not for prevention

Therapy – Other Formulations

- Sprays
  - Read indication and precautions
  - Use 3 days after shampooing
  - Absorption increased in lesional skin
  - Difficult/toxic in cats
- Powders
  - Good knock down effect
  - Usually low toxicity
  - Short residual effect
  - Dries fur and skin; may be messy

Environmental Management

- Treat all animals in the household including:
  - Non-allergic animals
  - Ferrets, small mammals
  - Dogs that visit the home
  - Dogs that the flea allergic patient visits

Environmental Management

- Wet mop hard surfaces
- Wash or dispose of bedding regularly
- Vacuum often - removes organic debris and up to 20% of larvae and 32-59% of eggs
- Do not wash or steam clean carpets as it increases larval survival

Environmental Management

- Indoor spray
  - Must have both adulticide and IGR
  - Adulticides toxic to birds and fish
- Foggers or "bombs"
  - Not recommended due to poor distribution and penetration

Pyriproxyfen, pyrethrins, permethrin

Environmental Management

- Use sprays containing IGR if available
  - Under and on rugs
  - On all carpeted surfaces and in closets
  - On upholstered furniture, under cushions, on beds, under furniture
  - In car any any places dog visits (work, friend's home)

Environmental Management

- *C. felis* parasitizes wildlife commonly
  - Wildlife may be important in contaminating the outside environment
  - Opossums, raccoons, feral cats
  - Rarely squirrels, rabbits, birds

Causes of Failure

- Poor client compliance
- Use of ineffective products
- Insufficient dosage
- Lack of application to whole house
- Use of adulticide without IGR
- Use of IGR without adulticide
- Long duration between applications

- Teach owners how to use a flea comb and recognize flea feces
- Write the dates of treatments on the calender or set alert
- Synchronize all monthly treatments

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